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REVIEWS

Het Verband tusschen den plistoceenen Ijstijd en het Ontstaan der Soenda-Zee (Java- en Zuid-Chineesche Zee) en de Invloed daarvan op de Verspreiding der Koraalriffen. . . . . (The Sunda Sea and Its Barrier Reef.) Door G. A. F. MOLENGRAAFF. . . . . K. Akad. Wet. Amsterdam, Verslag der Afdeeling Natuurk., Vol. XXVIII, 1919, pp. 497-533.

The shallow Java Sea between Java-Sumatra and Borneo and the confluent shallow southern part of the China Sea are united by Molengraaff under a single name, the Sunda Sea. He accounts for the flat sea floor, nowhere more than 40 fathoms deep, by supposing that, so far as its area was already a lowland of weak rocks in pre-Glacial time, it was worn down still lower during the Glacial epochs of lowered sea surface, and that its deeper, sea-covered parts were in the same epochs filled up to a corresponding level. Large rivers, fed by the heavy rainfall of the region, are thought to have been active agents of gradation. The degraded and aggraded lowland was submerged and the present sea created when the ocean finally rose to its normal level in post-Glacial time. The margin of the submerged lowland is assumed to lie at the present 40-fathom line, outside of which a relatively rapid descent is made to deep water. Evidence of submergence is found not only in the embayed mouths of tributary rivers not yet filled with deltas, but also in the occurrence of detrital tin ore in the extension of river courses a mile or more from the shore of certain tin-bearing islands. The fine sediments by which the sea bottom is now covered are regarded as river deposits laid down while the sea was rising to its present level.

Although the region here considered—Sundaland, as Molengraaff calls it—is known on the basis of abundant geological evidence to have long been much more stable than the disturbed region of the several deep seas and many islands farther east, the essential exclusion of crustal subsidence and the restriction of the Sunda sea-floor origin to so short a geological interval as the Glacial epochs of the Glacial period seem open to question. Moreover, the present margin of the shallow floor near the 40-fathom line, which Molengraaff regards as the built-out border of the worn-down lowland when the Glacial ocean was lowered, is open to another interpretation. It may be explained as the outer margin of a continental shelf that has been gradually forming through late Tertiary and Quaternary time, the final touches having been given to it in post-Glacial time by the action of waves and currents on the fine silts that are so abundantly supplied by the inflowing rivers; the sea water is today sometimes discolored 60 km. from the river mouths. It may be recalled in this connection that Daly has found that "the charts of the world show the break of slope on the [continental] shelves to be near the 40-fathom line," and that it is only to this depth that "waves and currents are competent to advance the outer edge of a continental embankment with noteworthy speed." Hence, instead of interpreting the 40-fathom edge of the Sunda Sea bottom and the edges of many other continental shelves of like depth as marking continental shore lines when the ocean was lowered in the Glacial epochs—the ocean lowering being calculated, singularly enough, to have been but little less than the same measure of 40 fathoms—these shelf edges are better interpreted as being due in significant measure to the adjustment of the submarine profile to normal sea-level by submarine processes in post-Glacial time.

Coral reefs are rare or wanting in the Sunda Sea by reason of the muddiness of its bottom and the resulting impurity of its waters, as Sluiter explained thirty years ago. But the margin of the eastern part of the sea floor, the so-called Borneo bank, is occupied by an imperfect and discontinuous barrier reef for over 450 km. Molengraaff points out that the reef is separated at its easternmost extension only by the 50- or 60-km. width of the deep-water Macassar Strait from the island of Celebes, while it is separated by 160 km. of shallow water from Borneo; hence it is related not to the nearer but to the farther one of these islands. The imperfection of the reef is ascribed to the muddiness of the sea-floor margin on which it is assumed to have originated as the ocean rose in post-Glacial time; but the muddiness of the shallow sea floor is so great that it is doubtful whether any reef could have originated there at all. The reef may perhaps be better explained as a recent upgrowth from such parts of a Tertiary reef as were not overwhelmed and destroyed by detrital deposits in the extension of the shallow sea floor while the ocean was lowered in Quaternary time.

Mention may be made of a number of imperfect atoll reefs which Molengraaff describes as bordering several extensive 20–40-fathom shoals that rise from deep water east of the Sunda Sea, in the region between the stable western islands and the unstable eastern ones. The chief reefs here are on the Kalu-Kalukuang bank, 98 by 58 km.; on the several Laars banks, about 65 km. in total length; on the Postillion bank, 140 by 50 km.; and on the Paternoster bank, 115 by 26 km. The 40-fathom depth of the bank margins is ascribed by Molengraaff, following Daly's Glacial-control theory of coral reefs, to abrasion during the Glacial epochs of lowered sea-level, particularly to the phases of rising sea-level; but it may be more plausibly ascribed to wave-and-current aggradation with reference to normal sea-level in post-Glacial time, as above suggested. For even if a bank 50 or more km. in diameter were cut away by the waves during the lowered stand of the ocean in the Glacial period, its margin ought to have been at least 20 or 30 fathoms below the sea-level of that time and hence not 40 but 55 or 65 fathoms below present sea-level, with a gradual shoaling toward its center. Departures from such a form should therefore, under the explanation of the banks by abrasion, be accounted for by post-Glacial reef growth and submarine aggradation. In any case, it would appear that, if no disturbance takes place, these imperfectly reef-rimmed banks will in time develop into typical atolls of large size.

W. M. D.

Atollen in den Nederlandsch-Oost-Indischen Archipel. De Riffen in de Groep der Toekang Besi-Eilanden. (*Atolls in the Dutch East Indies.*) Door Dr. B. G. Escher. Batavia, Java: Mededeelingen . . . . Encycl. Bureau, Vol. XXII, 1920, pp. 7–18.

There has been discussion for some years past among the geologists of the Dutch East Indies as to the occurrence or absence of true atolls in their archipelago. Although atolls are certainly rare in that region, the occurrence of several typical examples is made clear by Escher, who had opportunity in March, 1919, of examining several reefs in the Tukang Besi group, southeast of Celebes. A copy of the original survey of the islands by the Hydrographic Service of the Dutch East Indies on a scale of 1:200,000, containing a greater number of soundings than those represented in the chart published for the use of navigators, is reproduced in Escher's paper. It shows seven atolls, the smallest about 2 km. in diameter; the largest measuring 48 by 15 km. and inclosing a lagoon 15 or 20 fathoms deep. Escher points out that these atolls lie in two belts, trending northwest-southeast, 100 or 130 km. in length, and that between the two belts and to the northeast of both of them are two roughly parallel belts of high islands bearing raised reefs, with fringing reefs at sea-level. The overall breadth of the four belts is about 140